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THE DISTINGUISHING CHARACTERS OF THE SEEDS OF QUACK-GRASS AND OF CERTAIN WHEAT-GRASSES.

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THE DISTINGUISHING CHARACTERS OF THE SEEDS OF QUACK-GRASS AND OF CERTAIN WHEAT-GRASSES.[a]

INTRODUCTION.

In view of the noxious character of quack-grass, quitch-grass, or couch-grass (*Agropyron repens* L.), the recognition of its seeds as an impurity of commercial seeds is important and desirable. This matter has special significance in connection with the seed of the forage plant known as awnless, or Hungarian, brome-grass (*Bromus inermis* Leyss). Brome-grass is extensively handled in the American market, and much of the seed offered is imported either from Europe or from the western provinces of Canada.

Examination of samples of brome-grass seed taken from imported lots shows that seed from Europe invariably contains seed of quack-grass, which is rarely found in seed from Canada. In the place of quack-grass seed the Canadian brome-grass seed usually contains seed of one or another of the wheat-grasses which are native to the Western States and to Canada and which have much the same habit of growth as quack-grass. Since these wheat-grasses are native to this country and to Canada, their seeds do not appear in brome-grass seed imported from Europe. The seeds of the wheat-grasses are so similar to those of quack-grass that they may readily be mistaken for the latter. It becomes important, therefore, that the presence of the seed of quack-grass in brome-grass seed be detected with certainty and that lots of brome-grass seed carrying seed of wheat-grass only may be distinguished and not rejected as suspected of containing quack-grass seed.

The purpose of this paper is to so point out the distinguishing characters of the seeds of quack-grass and of the two kinds of wheat-grasses chiefly involved that their presence as an impurity of brome-grass or other forage-plant seeds may be practically determined.

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[a] The distinguishing of the seeds of quack-grass, one of the greatest weed pests in the Northwest, from seeds of similar appearance is of importance in all regions where quack-grass may become troublesome. In the present paper the characteristic differences between the seeds of quack-grass and the seeds of other grasses of similar appearance have been pointed out in such a practical way as to furnish a means of readily determining the presence or absence of quack-grass seed in commercial seed.—Wm. A. Taylor, *Acting Chief of Bureau.*

Quack-grass and the wheat-grasses are closely related botanically, belonging to the same genus, Agropyron. The wheat-grasses commonly appearing in brome-grass seed are slender wheat-grass (*Agropyron tenerum* Vasey) and western wheat-grass (*Agropyron occidentale* Scribn.),[a] known also in the West as Colorado bluestem.

Owing to the close relationship of these grasses, their seeds, taken individually at least, appear to be practically indistinguishable. The structure and fruiting habits of the seed clusters, however, afford means for their recognition which appear to be well founded.

NATURE OF THE SEEDS OF AGROPYRON.

The individual seeds, or ripened florets, of Agropyron are produced in clusters termed "spikelets," each spikelet containing several seeds. At maturity the spikelets usually tend to break apart, permitting the seeds to separate. Not all the spikelets thus wholly go to pieces, but some appear in their entirety or in part in samples of seed. Thus, the term "seed," as popularly employed, refers in this case both to whole or partial spikelets and to individual seeds.

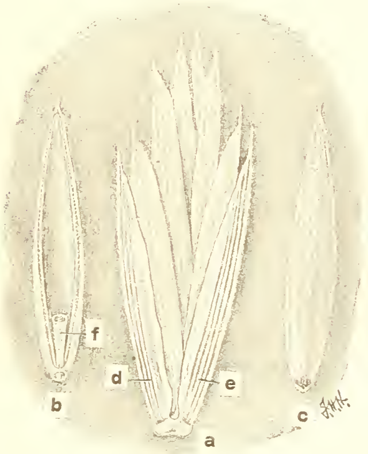

FIG. 1.—A spikelet and seeds of quack-grass, showing the general structure of the spikelets and seeds of Agropyron: *a*, A complete spikelet; *b*, the inner face of a seed, showing the grooved palea and the rachilla segment (*f*); *c*, a seed, showing the rounded back of the lemma; *d* and *e*, glumes of the spikelet. (Enlarged.)

The complete spikelet (see fig. 1, *a*) consists of a pair of oppositely placed, somewhat unequal, slender scales, or glumes (*d* and *e*), united at the base of the spikelet, and several alternately arranged "seeds," or ripened florets, situated between and above the glumes. The glumes are united side by side or on the same level, which is a readily observed mark of distinction in spikelets of Agropyron. They are more or less distinctly veined lengthwise, the veins varying from three to seven in the kinds under consideration. The variation in size and form of spikelet and in form, venation, etc., exhibited in the glumes of these kinds of Agropyron affords marks of distinction.

The individual seeds (see fig. 1, *b* and *c*), or ripened florets, consist of the grain inclosed between two scales, one of which, the lemma, is

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[a] *Agropyron occidentale* Scribn. is described in the seventh edition of Gray's Manual under *A. smithii* Rydb., and in Britton's Manual under *A. spicatum* (Pursh) Scribn. and Sm.

larger than the other, the palea. The seeds are broadly grooved on the side bearing the palea (*b*) and rounded on that bearing the lemma (*c*). A portion of the cluster axis, termed the "rachilla segment" (*f*), appears at the base of the grooved palea of the seed. The individual seeds of Agropyron are so similar that no attempt is made here to distinguish the kinds by them. The number of seeds per spikelet varies from four or five to twelve. Both glumes and seeds may be either acute or awn pointed at the tips.

The spikelets are attached facewise to the axis bearing them (see fig. 2, *a* and *b*), differing from other grasses in which the spikelets are attached edgewise to the axis.

The spikelets and seeds of Agropyron are generally straw colored or tinged with green.

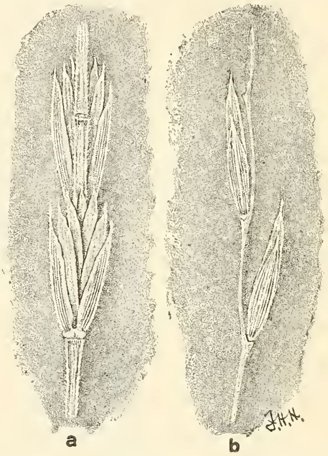

FIG. 2.—A section of the seed cluster of quack-grass, showing the mode of attachment of the spikelets to the rachis, or cluster axis: *a*, Side view; *b*, edge view. (Enlarged.)

THE SEEDS OF AGROPYRON AND OF BROME-GRASS COMPARED.

Seeds of awnless brome-grass (see fig. 3, *a*) are about three-eighths of an inch long, flattened and thin, light brown, the darker grain evident through the thin palea, which is more or less wrinkled and bears two slender, hairy veins. The slender rachilla segment is hairy. The rounded back, or lemma, of the seed is more or less distinctly five veined. The seeds of brome-grass are larger than those of quack-grass (fig. 3, *d*) and smaller than all except the smallest of the spikelets of the latter (fig. 3, *c*). Samples of brome-grass seed usually contain partial spikelets of brome-grass (fig. 3, *b*), which are not likely to be confounded with the spikelets of quack-grass when compared with the latter. The generally lighter color of the quack-grass seeds and spikelets, together with the opposite attachment of their glumes, serves to distinguish them from the brome-grass seeds.

THE SEEDS OF QUACK-GRASS, SLENDER WHEAT-GRASS, AND WESTERN WHEAT-GRASS DESCRIBED.

The following descriptions are designed to point out the contrasting characters of the mature spikelets of quack-grass, slender wheat-grass, and western wheat-grass, as they appear in commercial samples of seed.

QUACK-GRASS (AGROPYRON REPENS, L).

The spikelets of quack-grass (fig. 4) vary from one-half to three-fourths of an inch in length and contain four to seven seeds. Both glumes and individual seeds may be merely acute or may bear a short awn at the apex. The glumes may diverge somewhat, well exposing the seeds, or they may be nearly parallel, nearly covering the lower seeds. The two faces of the spikelet may be about equally convex and the angles between the glumes about equal on the two faces, or the faces may be unequally convex and the glumes more widely separated on the more convex face than on the other. The seeds extend beyond the tips of the glumes from slightly to half the length of the glumes. The glumes (see figs. 4 and 5) are five veined or seven veined, the veins distinct, the central or keel vein a little coarser than the others, giving the glumes a slightly keeled form. The margins of the glumes are thin, papery, narrowing to the apex, and usually merge abruptly into the pointed or awned tip.

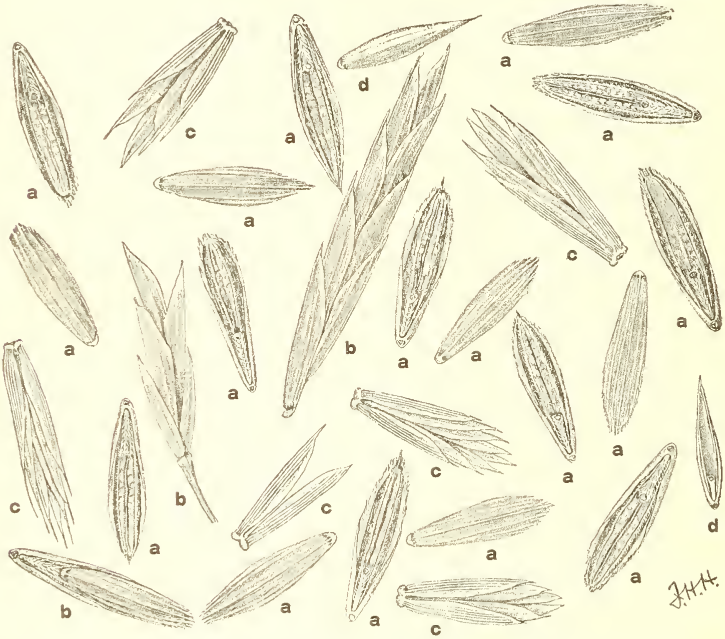

FIG. 3.—A mixture of seeds of awnless brome-grass (*a*), partial spikelets of brome-grass (*b*), spikelets and glumes of quack-grass (*c*), and seeds of quack-grass (*d*). (Enlarged about 2¼ times.)

Mature spikelets of quack-grass tend to retain the individual seeds and in consequence whole or partial spikelets always appear along with the comparatively few individual seeds in samples of brome-grass seed containing seeds of quack-grass.

SLENDER WHEAT-GRASS (AGROPYRON TENERUM, VASEY).

The spikelets of slender wheat-grass (fig. 6) vary from one-half to three-fourths of an inch in length and contain four to seven seeds. Both glumes and seeds may be slenderly acute or short awned at the apex. The glumes may diverge somewhat in mature spikelets, but they are commonly nearly parallel and curved at the back, the tips curving inwardly over the seeds, which exceed the glumes scarcely at all or by as much as one-third the length of the glume. The spikelets usually taper from the center to both ends both facewise and edgewise, the two faces being unequally convex, the glumes being more widely separated on the more convex face. (See fig. 6, *c*, *d*, and *e*.) The spikelets are generally narrower than those of quack-grass, the base being smaller as a rule.

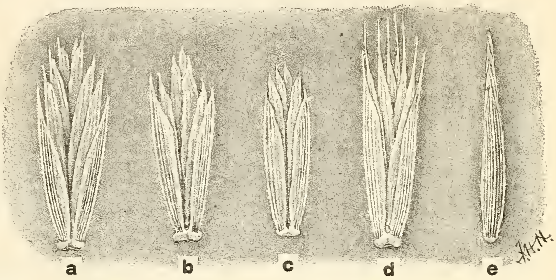

FIG. 4.—Spikelets of quack-grass, showing different forms. Note the forms of the glumes in *a*, *b*, *c*, *d*, and the awned form of glumes and seeds shown in *d*; *e*, edge view of spikelet. (Enlarged.)

The glumes (see fig. 6) are relatively broader than those of quack-grass, five veined to seven veined, the veins slender and distinct, the middle or keel vein scarcely coarser than the adjacent ones, and the glume rounded at the back rather than keeled or angled. The thin, papery margins of the glumes narrow gradually to the tapering or awned apex.

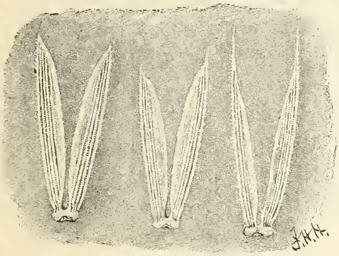

FIG. 5.—Empty glumes of quack-grass spikelets, showing common forms. (Enlarged.)

Mature spikelets of slender wheat-grass tend to break apart readily, only occasional complete spikelets appearing in commercial samples of seed. Empty glumes (see fig. 6, *a*) often remain united and appear both free from and attached to a part of the seed-cluster axis. As an impurity of brome-grass seed, slender wheat-grass, therefore, usually appears as free seed, with occasional spikelets or glumes to be depended upon for identification.

WESTERN WHEAT-GRASS (AGROPYRON OCCIDENTALE, SCRIBN.).

Well-developed spikelets of western wheat-grass (see fig. 7, *a*) are larger than those of either quack-grass or slender wheat-grass, often equaling an inch in length, but are commonly between five-eighths and three-fourths of an inch in length, lance shaped and compressed facewise. The slender glumes are more or less divergent, exposing the lower seeds. In the larger spikelets the seeds exceed the glumes equal to the length of the latter, making the larger spikelets twice as long as the glumes. The seeds are narrowly acute or awn pointed at the apex.

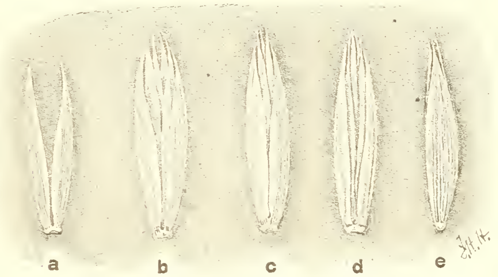

FIG. 6.—Empty glumes (*a*) and spikelets of slender wheat-grass. Note the forms of the glumes: *c*, *d*, Opposite sides of a spikelet, showing the relative position of the glumes, *d* being the inner, more convex side; *e*, edge view. (Enlarged.)

The glumes (see fig. 7) are stiffish, narrowly lance shaped, and awn pointed, three veined or five veined, the middle vein somewhat coarser than the others, giving the glumes a slightly keeled form, the veins distinct or often obscure. The margins of the glumes are thin and papery, chiefly below the middle, and taper gradually to the pointed apex.

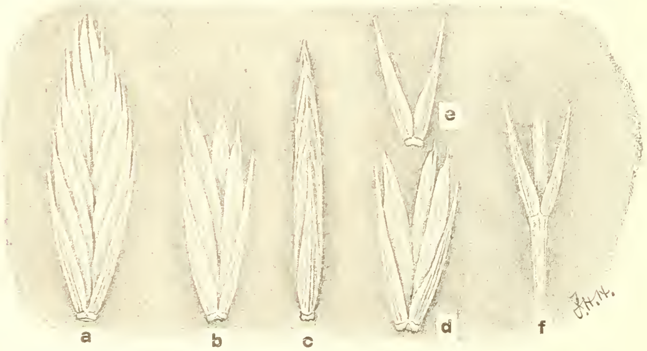

FIG. 7.—Spikelets and glumes of western wheat-grass: *a*, One of the larger spikelets having the maximum number of seeds; *b* and *d*, small spikelets having few seeds; *c*, edge view of a spikelet; *e*, free, empty glumes; *f*, empty glumes attached to a portion of the cluster axis. Note the form of the glumes. (Enlarged.)

Mature spikelets of western wheat-grass break apart readily, the seeds separating from the glumes. Samples of commercial seed, such as brome-grass seed, containing seed of western wheat-grass have few empty glumes (fig. 7, *e*), some of which may remain attached to the spikelet axis (fig. 7, *f*).

SUMMARY.

(1) Seed of quack-grass is a common impurity of certain kinds of commercial seed, especially of the seed of awnless brome-grass (*Bromus inermis*).

(2) Quack-grass seed appears in all lots of brome-grass seed imported from Europe and may occur in brome-grass seed produced in Canada or the Western States.

(3) Brome-grass seed produced in Canada or the United States often contains seed of wheat-grasses, which is likely to be mistaken for quack-grass seed. It is therefore desirable to distinguish between quack-grass seed and the similar seed of the wheat-grasses.

(4) Seeds of quack-grass in brome-grass seed appear chiefly as whole or partial spikelets, while few such spikelets of the wheat-grasses occur in samples containing seed of these grasses.

(5) The most evident identifying characters of quack-grass and wheat-grass seeds appear in the spikelets and their glumes.

(6) While it is usually possible to determine which kind of Agropyron is in a sample of seed, the presence or absence of quack-grass seed with reference to awnless brome-grass seed should be determinable without difficulty.

Approved:
JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *October 28, 1910.*

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